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Color and markings much as described for the female; the vermiculate markings on the anterior pronotum are not so clear (in this specimen); scutellum with two black dots before the black incised line; beneath, dark dirty yellowish brown, paler posteriorly; its face with nine brown arcs; the black lateral line cutting the eye is visible in front of the eye only; the apex of head is bisected by a yellowish line.

Described from one male specimen taken at Fort Myers, Florida, April 23, 1912; at light; Mr. William Davis collector. The specimen was killed shortly after moulting, but its condition is such as to warrant the above description. Allotype in the Collection of Mr. Wm. T. Davis.

IDIOCERUS SCURRA GERMAR, A POPLAR LEAFHOPPER.

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This species first attracted our attention during the summer of 1916 when Lombardy poplars in a nursery at Irvington, N. J., were found to be badly infested by nymphs and adults. During the summer of 1917 an opportunity was presented to study this insect. When our work was almost completed, it was brought to our notice by Mr. E. P. Van Duzee that *Idiocerus gemmisimulans* L. & C., was a synonym of *scurra* Germ., and Mr. W. H. Brittain, who has examined the types of *I. gemmisimulans* at Cornell, came to the same conclusion. *Idiocerus gemmisimulans* was treated in part by Leonard and Crosby in the Jour. Econ. Ent., Vol. 8, No. 6, p. 541, but in order to add further to the knowledge of the species, the publication of this paper was decided upon.

Idiocerus scurra Germ. appears to be well distributed in New Jersey in spite of the fact that it does not appear in Smith's "List of the Insects of New Jersey." It has been found in New Jersey on both Lombardy (*Populus nigra italica*) and Carolina poplars (*Populus*

* The arrangement of the authors' names is alphabetical only and indicates neither seniority nor precedence.

deltoides) especially Lombardy at the following places, Kingston, Irvington, New Brunswick, Red Bank, Bound Brook, Springfield, Ridgefield, Plainfield, Nutley and Rutherford and undoubtedly exists in many other places. In Van Duzee's "Check List of the Hemiptera of America, North of Mexico," its distribution is roughly given as "eastern states to Mississippi Valley and eastern Canada." Leonard and Crosby record it from Ithaca, N. Y., and Mr. Van Duzee states that it was common on poplars at Buffalo, N. Y., in October, 1912, and that as far as he knows, it was first taken in this country in October, 1909, at New Haven, Conn., by B. H. Walden.

Overwintering takes place in the egg stage, the eggs being found as a rule in the twigs, just above and concealed by the buds. They are covered only by a thin layer of bark, which becomes brown and somewhat wrinkled. Upon removing a bud, the place of oviposition is readily seen. On each side of the wrinkled, raised bark is a longitudinal crack. The bark covering the eggs is so thin that in many cases the contour of the eggs is discernible. Upon removing the thin covering of bark, the eggs can be seen arranged in a row, with the tips pointing upward and outward. Where five or six eggs were found, the row was somewhat curved. Each long, whitish egg lies flat against the adjoining one. Groups of three, four and five were common with three predominating. In several cases from nine to twelve were found in a single batch. Leonard and Crosby state that they found the eggs in groups of five to ten, eight being a common number. In some instances eggs were found irregularly laid in the twig tissue between the buds and sometimes close to but not in the tissue above the bud. At other times, eggs were found in leaf petioles and in one case in the heavy midrib of the leaf. These exceptions were more prevalent when many females had oviposited in the same twig. The eggs were always found in the last made growth of the twig or what amounts to green wood when egg deposition is under way. Every part of a young twig is utilized except the tip. Here the buds are close together, the tissue is very tender and watery and evidently unsuitable for egg deposition. In a severe infestation, from 48 to 50 eggs were found in each linear foot of twig. This is allowing sixteen buds to the foot and three eggs above each bud.

In the field hatching started about May 28 after a delay of at least a week on account of cool, unfavorable weather. In the laboratory,

the length of each nymphal stage was as follows: First, four days; second, five days; third, six days; fourth, five days; fifth, six days. This makes a total of 26 days or almost one month for all nymphal stages. In the field conditions closely approached this, thirty days being required according to field observations. After hatching, the nymphs make their way to the terminal leaves on the twigs and can be found usually on the under sides but to a certain extent on the upper. Where many are present, the upper surface of the leaf becomes characteristically whitish and discolored. Upon reaching the fourth stage, the nymphs scatter and many of them are found on the twigs resting with their heads downward. The nymphs in the later stages are very active and move rapidly when disturbed and like some other species move to the side of the twig away from the observer. This habit is also common with the adults. After emergence, the adults also scatter and can be found on all parts of the trees. Trees from 20 to 25 feet high were found to have fourth- and fifth-stage nymphs and adults on the topmost branches.

During the last few days of June adults of the first brood were quite plentiful, most of them preferring to rest on the twigs where they could be found without difficulty. By the end of the first week in July many eggs were being laid. These summer eggs required about two weeks for hatching and by August 23, seventy-five per cent. of a second brood of adults had emerged and a few overwintering eggs were being laid. Like the first brood of adults, these also scattered over the trees.

During egg deposition, the female rests parallel to the twig with her head pointing toward the top and her ovipositor inserted at right angles in the bark tissue under the bud, the tissue of the twig being torn into a slit-like opening. The operation of egg-laying also causes a similar slit to appear on the other side of the bud. Females collected June 29 and dissected showed eggs just starting to develop or partly developed and at this time, the ovaries in each female contained from 19 to 22 eggs. On July 14, when egg-laying was well under way, the number of eggs found in dissected females varied from 8 to 20. It was not possible at any time in the season to find more than 22 eggs and this probably represents the maximum number, as a number of dissections were made.

Inasmuch as the eggs are usually deposited in groups of three,

four and five, each female oviposits several times. It was noticed that the nymphs in shaded situations did not develop as rapidly as those exposed to full sunlight and for this reason and on account of the length of time over which oviposition extended, it was always possible to find a few newly emerged adults a couple of weeks after the main brood had appeared and oviposited.

On July 23, a parasite was noted ovipositing in the tissue directly over *scurra* eggs. This was kindly identified for us by Mr. J. C. Crawford through the courtesy of Dr. L. O. Howard as *Gonatocerus maga* Girault. Leonard and Crosby found the eggs being parasitized by a new species which they named *Gonatocerus ovicenatus* and which they state is very close to *G. maga* Gir. While examining overwintering eggs, a few round holes were noted in the bark overlying the egg clusters, but up to the present we have not been able to find Leonard's and Crosby's species. On one occasion an adult was observed attacked by *Podisus maculiventris* Say (Hemip.) which had its beak inserted just behind the first pair of legs while a Hemipterous nymph had its beak inserted in the extremity.

It is thus evident that in New Jersey there are two broods. Overwintering eggs hatched the latter part of May and adults appeared during the last of June. Females of this brood oviposited during the first two weeks of July and by the last week in August, adults of a second brood were plentiful. Overwintering eggs were laid chiefly during the first two weeks of September but egg-laying continued throughout the month and adults of both sexes lingered on the trees throughout the remainder of this month and during part of October. On September 13, a few first- and second-stage nymphs were noted and their presence indicated the beginning of a partial third brood. A week later however they had disappeared and no further evidence of a third brood could be found.

Descriptions of the nymphal stages can be found in Leonard's and Crosby's paper but as the nymphs vary in size, color and markings and as our descriptions are not identical with theirs, it was thought advisable to include them in this paper.

Egg.—Length 1.4 mm. Greatest width 0.35 mm. Translucent, cylindrical, slightly curved when viewed laterally; broadly rounded at basal end. Apical end obliquely truncate and acute. Cap causing truncation narrowly oval, brown in color.

First Stage Nymph.—Length 1.2 mm., width of head including eyes 0.53 mm. Antennæ about one third length of body, whitish except first and second segments which are brown. Eyes prominent, reddish, consisting of numerous distinct ommatidia. Body sparsely hairy. Head, dorsal and lateral surface of thorax, dorsal and lateral surfaces of abdomen brown. Median dorsal line beginning on head extending through thorax broadening slightly on posterior parts of thoracic segments, especially on the metathorax, where it forms a white band between thorax and abdomen. Ventral surface light except for broad median line on abdomen. Legs brown save coxa, trochanter, basal portion of femur and apical portion of tibia which are light. Rostrum white, extending to third pair of legs.

Second Stage Nymph.—Length 1.8 mm., width of head including eyes 0.8 mm. Antennæ similar to those of preceding stage, slightly darker. Eyes similar to those of preceding stage. Hairs on body more pronounced. General color similar to that of preceding stage but intensified. Broad median white stripe on dorsum of thorax more pronounced. First abdominal segment and part of second abdominal segment whitish. Small white patch in middle of third abdominal segment. Irregular whitish areas in center of abdominal segments five, six and seven (latter white patches absent in some specimens). Ventral surface like that of first stage (more pronounced in some specimens, less in others). Legs quite hairy, brown except coxa, trochanter, base of femur which are light. Rostrum extending to second pair of legs.

Third Stage Nymph.—Length 2.8 mm., width of head including eyes 1.1 mm. Antennæ about one fifth length of body. First and second segments dark brown, remainder lighter. Eyes similar to those of preceding stage. Dorsal surface dark brown, vertex of head light. Broad, median, irregular dorsal white band on thorax, extending into third abdominal segment in some specimens. Broad, whitish patch in middle of sixth abdominal segment. (Some specimens have, in addition, white patches on abdominal segments 5 and 7 and light spots on eighth abdominal segment.) Sides of meso- and metathorax extending somewhat caudad. Legs similar to those of preceding stage save articulation between femur and tibia, which is somewhat lighter. Rostrum white, extending to beyond second pair of legs. Ventral surface similar to that of first stage.

Fourth Stage Nymph.—Length 4.0 mm., width of head including eyes 1.65 mm. Antennæ and eyes similar to those of third stage. Color markings somewhat similar to those of third stage save brown of thorax which is lighter and brown of abdomen which is darker. Light markings on median dorsal surface more pronounced. Lateral posterior extensions of meso and metathorax more pronounced than in preceding stage. Legs similar to those of third stage with distal ends of tibiæ somewhat lighter. Ventral surface similar to that of preceding stage. Sexes plainly distinguishable in this stage.

Fifth Stage Nymph.—Length 5.5 mm., width of head including eyes 1.9 mm. Antennæ comparatively shorter than in preceding stage. Color and markings similar to those of preceding stage but more variable, the brown color varying from light brown to brownish black. In some specimens the dorsal surface is brown except the median portions of the metathorax and abdominal segments one, two, five and six, which are light. In other specimens the lighter markings of the dorsal surface are more extended. The posterior margins of abdominal segments seven, eight and nine bear pronounced hairs. Wing pads extending beyond anterior margin of fourth abdominal segment. Ventral surface light. Legs lighter in color, markings similar to those of preceding stage. Rostrum extending to middle of second pair of legs. Sexes plainly distinguishable in this stage.

Adult.—Idiocerus scurra Germ. The original description by Germar appeared in Fauna Ins. Europ., XVII, p. 11, 1834, as follows: "*Jassus scurra*: ocellis inferis, vertice lunato, pallidus, fusco-marmoratus, scutello signaturis nigris, collari transversim ruguloso, elytrorum venis fusco-maculatis, costali immaculata. Habitat in Germania."

Through the kindness of Mr. E. P. Van Duzee we are able to include the following references to *Idiocerus scurra.*

Germar, Fauna Ins. Europ., XVII, p. 11, 1834, *Jassus.*
Herrich-Schaeffer, Nomen. Ent., I, pp. 69, 112, 1835, *Bythoscopus.*
Burmeister, Genera Ins., pl. 10, 1838.
Walker, List. Homop., III, p. 859, 1851, *Bythoscopus.*
Kirschbaum, Die Gattung Idiocerus, p. 18, 1868.
Kirschbaum, Cicad. v. Wiesbd., p. 160, 1868.
Melichar, Cicad. Mitt. Europ., p. 151, 1896.

syn. ♀ *crenatus* Germar, Fauna Ins. Europa., XVII, p. 10, 1834, *Jassus.*

Kirschbaum, Cicad. v. Wiesbd., p. 167, 1868, *Bythoscopus.*

syn. *germari* Fieber, Verh. Zool.-Bot. Ges. Wien., XVIII, p. 451, 1868.

syn. *gemmisimulans* L. & C., Jl. Econ. Ent., VIII, p. 542, pl. 30, 1915.

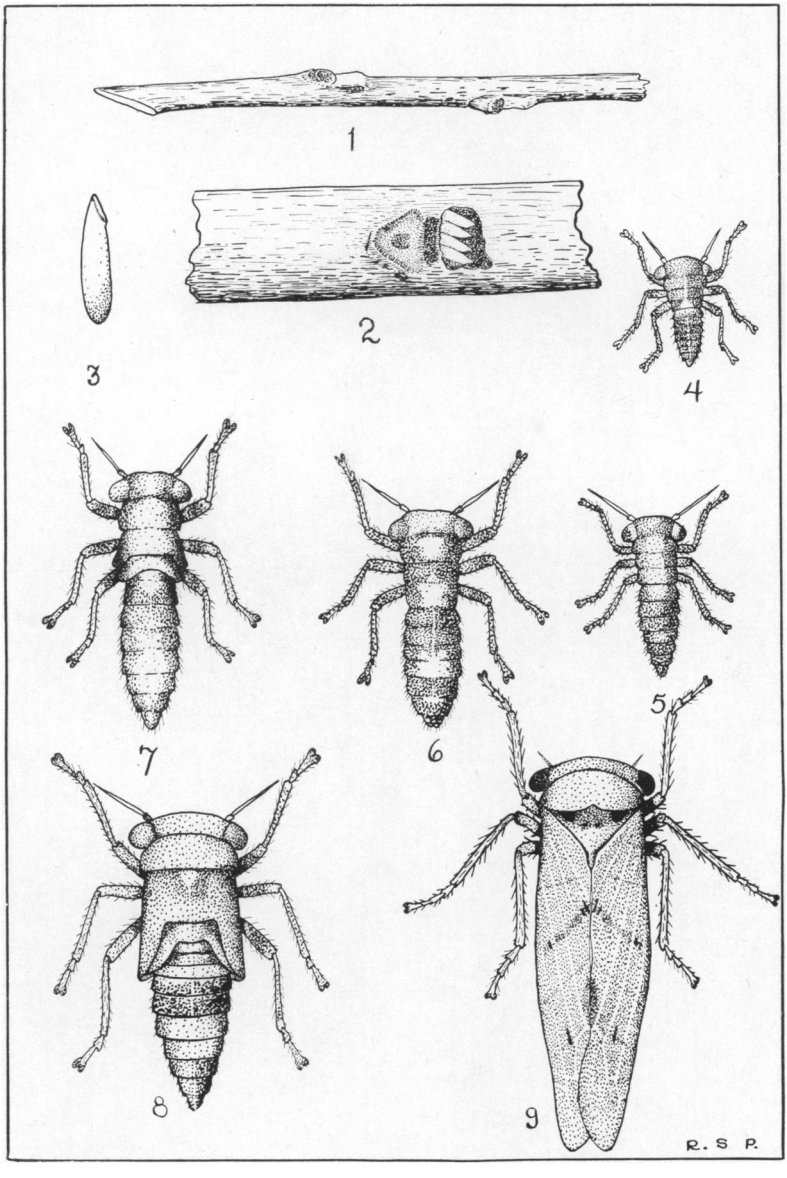
The species as observed by us exhibits some variation as to markings and intensity of color especially in the males. The females are lighter than the males and have their wing markings less pronounced. The majority of the second brood of females were of a decided reddish brown color. As already noted there is considerable variation in nymphal color markings but among the many which we have observed, none has been found which exactly corresponds in color markings to those illustrated by Leonard and Crosby.

It is evident that *Idiocerus scurra* is not a native American species. It was probably brought into this country from Europe, evidently in the egg stage with Lombardy poplar which was the first ornamental tree introduced into the United States. It is said that the native home of the Lombardy poplar is Afghanistan and that in early times it was cultivated in western Asia whence it was introduced into Europe. In New Jersey at least, *I. scurra* is becoming more abundant and widely distributed. In several cases it has been noted as occurring on poplars growing along city streets.

In closing we wish to express our indebtedness to Mr. E. P. Van Duzee for identifying the species and for his coöperation and help and to Mr. Andrew J. Mutchler for valuable assistance in enabling us to see the literature in the library of the American Museum of Natural History.

EXPLANATION OF PLATE XV.

Fig. 1. Twig with buds removed showing raised bark over eggs.
Fig. 2. Bark removed showing eggs in position.
Fig. 3. Egg.
Fig. 4. First stage nymph.
Fig. 5. Second stage nymph.
Fig. 6. Third stage nymph.
Fig. 7. Fourth stage nymph.
Fig. 8. Fifth stage nymph.
Fig. 9. Adult male, *Idiocerus scurra* Germ.



Idiocerus scurra.